Control ENGINEERING

INDEX

VOLUME 4...JANUARY–DECEMBER 1957

* For Illustration
(WN) For What's New
(IP) For Industry's Pulse
(Ed) For Editorials

Unless otherwise designated, items are feature articles or Ideas at Work.

A

Actuators

Adjustable speed drives: key to dynamic materials handling. J. E. Oram..Feb. 78
Constant-current speed control of dc motors. E. H. Dinger.....July *88
From controller output to process actuation. J. M. Salzer.....Sept. 183
How to estimate the resonant frequency of hydraulic actuators. B. C. Moore July 73
Modifying valve characteristics to fit the process. G. L. Roth.....Jan. 69
Power stepping motor—a new digital actuator. Thomas & Fleischauer Jan. *74

Aircraft

Computing-control applied to an airborne fire-controller. Pfister & Buder Sept.*138
Computing-control applied to wind tunnels. D. A. Lieberman.....Sept. 134
Control tools develop a new navigational system. D. J. Green.....Jan. *65
Convair 880—safety dictates duplicate controls (WN) .....Aug. *22
Digital computers earn their wings (WN) .....Sept. *26
Dynamic stability control increases aircraft range. D. M. Petrie.....Apr. 94
Six control problems solved by magnetic amplifiers. A. E. Maine.....Dec. *80
Tomorrow's Instrument Panel (WN) Dec. *29

Amplifiers

Electronic
  Applying thyratrons to control. J. H. Burnett. Pt I. Jan. 88. Pt II Servo applications and stabilization..Feb. 73
From controller output to process actuation. J. M. Salzer.....Sept. 183
Hydraulic
  Analyzing an arc furnace control system. J. H. Kogen.....Aug. *72
Magnetic
  Six control problems solved by magnetic amplifiers. A. E. Maine Dec. *80
Relay
  Use relays for power amplifiers. Gibson & Tuteur.....July 107

Analog-to-digital conversion

Analog-to-digital converters. G. G. Bower (tables) Apr.*107
Can you take advantage of the cyclic binary-decimal code? H. R. Glixon (tables) .....Mar. 87
Converting process data into controller inputs. R. O. Maze (tables)...Sept. 176
Exploiting the mercury jet switch. W. R. Davis.....Feb. *69

Analysis instruments

Chromatography analyzes gas and vapor products in the plant. E. G. Fellows July 75
Improved ratio control with composition analyzer Jan.*113
Infrared process-stream analyzers. D. J. Troy (tables) Nov.*116
Nuclear magnetic resonance. A. R. Aikman & others (tables).....June*105
Photometric stream analyzers—versatile instruments for measuring composition. L. G. Glasser (tables)....Oct. *87
Process-stream refractometers. L. G. Glasser (tables) .....Dec. *96
Radioactivity analyzers liquids and gases. V. N. Smith (tables).....Aug. *86

Atomic power

British plan two-reactor power plant. R. J. Smith (WN).....Apr. *27
New nuclear power plants shun feedback control systems (WN)....Apr. *23

B

Batch processing

Batch process sequenced by rates of change. H. B. Breedlove.....Feb.*117
Optimizing control of a chemical process. Eckman & Lefkowitz..Sept. 197

C

Checkers

Checking techniques for digital computers. R. W. Hamming.....May 111

Circuits

Applying thyratrons to control. J. H. Burnett. Pt I Jan. 88. Pt II Servo applications and stabilization...Feb. 73
Sensing nulls with dual-range compression circuits. E. F. Nowak....Nov.*108
Servo modulators IV—Seven lab-built circuits and their test-obtained characteristics. L. S. Klivans.....Dec. *90
Six control problems solved by magnetic amplifiers. A. E. Maine.....Dec. *80
Triggering electronic flip-flops from mechanical switches. Roland Yii Oct. *71

Coding of data

Analog-to-digital converters. G. G. Bower (tables) Apr.*107
Can you take advantage of the cyclic binary-decimal code? H. R. Glixon (tables) .....Mar. 87
Digital answer to data telemetering. Ragland & Wassall.....Aug. *95

Compensation

How to phase-compensate loaded potentiometers. Jack Gilbert.....Jan. *82
Improve servo performance with tachometer limiting. Robert Seinfeld June 123
A method of compensating loading errors in double-ended potentiometers. Jules Sandock.....Mar. 109
A thermistor selecting shortcut (table) Jan. 73

Components

Control engineers revitalize dc equipment business (IP).....May 61
Solion shows promise (WN).....Aug. *32
Spacistor pushes back frequency limits on semiconductors (WN).....Sept. *56

Composition measuring (see Analysis instruments)

Computers

Analog
  Analog computer as a process controller. D. W. Russell & others Sept. *160
  Computer demonstrates missile yaw. S. E. Dorsey.....Oct.*111
  Interpolating point-to-point inputs for continuous machine control. Speller & Cooney.....June*114
  Optimizing control of a chemical process. Eckman & Lefkowitz Sept. 197
  Process-control problems yield to the analog computer. C. W. Worley & others .....June 97
Digital
  Basic Digital Series
    11. Solving problems with a digital computer. A. S. Householder Jan. 99
    12. Programming the computer. Rock & Klammer (tables)..Mar. 119
    13. Checking techniques for digital computers. R. W. Hamming May 111
  Digital application series
    12. Fitting the digital computer into process control. Phister Jr. & Grabbe .....June 129
    13. How input/output units affect data-processor performance. James Gibbons (tables).....July 97
    14. The digital answer to data telemetering. Ragland & Wassall Aug. 95
  Digital computer as a process controller. J. W. Tierney & others Sept. 166
  Digital computers earn their wings (WN) .....Sept. *26
  How the four-tape sorter simplifies storage. R. G. Canning.....Feb. 95
  New digital computer for process control (WN) .....Sept. 41
Special purpose
  Analog computer as a process controller. D. W. Russell & others Sept.*160
  Computing-control applied to an airborne fire-controller. Pfister & Buder Sept.*138
  Computing-control applied to a fractionating column. H. L. Engel Sept. 144
  Computing-control applied to a sintering process. T. R. Schuerger Sept.*130
  Computing-control applied to a tapered-sheet leveler. P. E. Dornbusch .....Sept. 141
  Computing-control applied to wind tunnels. D. A. Lieberman...Sept. 134
  Digital computer as a process controller. J. W. Tierney & others Sept. 166
  Interpolating point-to-point inputs for continuous machine control. Speller & Cooney.....June*114

Computing control

Analog computer as a process controller. D. W. Russell & others Sept.*160
Computing-control applied to an airborne fire-controller. Pfister & Buder Sept.*138
Computing-control applied to a fractionating column. H. L. Engel Sept. 144
Computing-control applied to a sintering process. T. R. Schuerger...Sept.*130
Computing control applied to a tapered-sheet leveler. P. E. Dornbusch Sept. 141
Computing-control applied to wind tunnels. D. A. Lieberman....Sept. 134
Control tools develop a new navigational system. D. J. Green.....Jan. *65
Converting process data into controller inputs. R. O. Maze (tables)..Sept. 176
Digital computer as a process controller. J. W. Tierney & others Sept. 166
Digital computers earn their wings (WN) .....Sept. *26
Fitting the digital computer into process control. Phister Jr. & Grabbe..June 129
From controller output to process actuation. J. M. Salzer.....Sept. 183
Goal is improved performance. W. E. Vannah .....Sept. 126
How to establish the control problem for an on-line computer. James &

Boksenbom ..... Sept. 148
Largest steerable radio-telescope (WN) Sept. *32
New digital computer for process control (WN) ..... Sept. 41
Optimizing control of a chemical process. Eckman & Lefkowitz.. Sept. 197
Role of statistical computation in machine-tool feedback gaging. D. N. Smith Sept.*190
What's the market for computing-control? (IP) ..... Sept. 109

Consistency

Control consistency with a flow bridge. Eolkin & Head..... Jan.*107

Continuous processing

Basic concepts of feedback control. B. E. Powell..... Apr. 101
Blending liquids by electronic process control. G. L. Laws..... Nov.*137
"The chemicals" find a springboard (Ed) ..... Feb. 67
Chromatography analyzes gas and vapor products in the plant. E. G. Fellows July 75
Computing-control applied to a fractionating column. H. L. Engel Sept. 144
Fitting the digital computer into process control. Phister Jr. & Grabbe.. June 129
Infrared process-stream analyzers. D. J. Troy (tables) Nov.*116
Nuclear magnetic resonance. A. R. Aikman & others (tables)..... June*105
Photometric stream analyzers—versatile instruments for measuring composition. L. G. Glasser (tables).... Oct. *87
Process-control problems yield to the analog computer. C. W. Worley & others ..... June 97
Process-stream refractometers. L. G. Glasser (tables) ..... Dec. *96
Radioactivity analyzes liquids and gases. V. N. Smith (tables)..... Aug. *86
Selecting loops for critical control. A. H. McKinney..... July 67
13 information systems service new Tidewater refinery (WN)..... June *24
What's available for measuring mass flow. G. T. Gebhardt..... Feb. *90

Controllers

Analog computer as a process controller. D. W. Russell & others..... Sept.*160
Basic concepts of feedback control. B. E. Powell..... Apr. 101
Digital computer as a process controller. J. W. Tierney & others..... Sept. 166
Simple noninteracting three-term controller. F. Steghart..... June 139

Costing

Guide to costs of industrial temperature measurement. H. R. Kalbfleisch (tables) ..... Oct. 81
How to buy control systems on bid. W. D. Bell..... Dec. 87

Counters

Triggering electronic flip-flop from mechanical switches. Roland Yii.. Oct. *71

D

Data files (reference sheets)

1. A thermistor selecting shortcut.. Jan. 73
2. Reliability of redundant systems. O. B. Moan..... Feb. 85
3. Key factors in selecting transistorized regulators. Michel Mamon Mar. 107
4. Reliability of series-parallel combinations. O. B. Moan..... Apr. 99
5. Reliability of redundant switches. O. B. Moan..... May 107
6. Getting maximum torque out of a two-phase servomotor. M. G. Rekoff Jr. ..... June 121
7. How to estimate the resonant frequency of hydraulic actuators. B. C. Moore ..... July 73
8. Effect of integrator motor time-constant on integration error. M. P. Pastel ..... Aug. 77
9. Guide to costs of industrial temperature measurement. H. R. Kalbfleisch (tables) ..... Oct. 81
10. Calculate gyroscope precession torque. A. E. Maine..... Nov.*115
11. Estimating damping ratio from frequency response. C. J. Savant Jr. Dec. *95

Data processing

Analog-to-digital converters. G. G. Bower (tables) Apr.*107
Bizmac starts operation at OTAC (WN) May 35
How input/output units affect data-processor performance. James Gibbons (tables) ..... July 97

Data reduction

At White Sands they track missiles in the lab and on the range. L. H. Young (tables) ..... Nov. *97
Data logging measures up to industrial needs (WN) ..... Jan. *21
13 information systems service new Tidewater refinery (WN)..... June *24
Transistorized data logger: reliability—but at a price (WN)..... Oct. *26
Users reflect on automatic data logging (IP) ..... Jan. 59
Will the logger-computer optimize refining? (WN) ..... Mar. *23

Data sampling

Exploiting the mercury jet switch. W. R. Davis..... Feb. *69

Data transmission

Digital answer to data telemetering. Ragland & Wassall..... Aug. *95
FM transmitter closes loop from inside reactor. Glass & Thompson.... Apr.*121
Transmitting data by light modulation. Decker & Mueller..... July *63
Weather data by digital telemeter. J. D. Humphreys (table)..... Dec.*102

Dead-time

Dead time simulated by transport delay. Cowley & Bremer..... Apr.*129
Simulate transport lags with magnetic tape. D. C. Reukauf..... June*145

Detection

Differential measurement makes RF fields useful. W. H. Buchsbaum Feb.*119
Electronic trail-finding. C. O. O'Rourke May*117
Scanning improves headlight dimmer. J. Rabinow Mar.*131
Synchronize alternators automatically Mar. 135
Thermistor hot-box detector..... May 121

Digital-to-analog conversion

From controller output to process actuation. J. M. Salzer..... Sept. 183
Punched tape to shaft position—mechanically. Albert Hohmann... Jan.*111

Discrimination

Scanning improves headlight dimmer. J. Rabinow Mar.*131

E

Editorials

Application engineering costs money Aug. 63
Donald Pierce Campbell..... Mar. 85
"The chemicals" find a springboard Feb. 67
Made, Not Born..... Dec. 69
Prepare now for the technician gap Nov. 93
Reduce meeting redundancy..... May 65
There's still a need..... Oct. 63
A Unesco for control?..... Jan. 63
Why not join R&D?..... June 95
Worry NOW about dynamics.... Apr. 77
You CAN buy performance..... July 61

Electronics

Blending liquids by electronic process control. G. L. Laws..... Nov.*137
Pitch g limiter protects F-102. C. G. Erickson Dec.*111
Sensing nulls with dual-range compression circuits. E. F. Nowak.... Nov.*108
Servo modulators
I Where and why they're used, characteristics of the basic types. B. T. Barber (tables)..... Aug. 65
II Electrochemical, electronic and semiconductor-diode units. B. T. Barber ..... Oct. *96
III Semiconductor modulators, magnetic modulators and tabulated characteristics of commercial units. Barber & Klivans (tables) Nov.*122
IV Seven lab-built circuits and their test-obtained characteristics. L. S. Klivans ..... Dec. *90
Use capacitance for accurate level measurement. F. W. Hannula.. Nov.*104

Engineers

There's still a need (Ed)..... Oct. 63
A Unesco for control? (Ed)..... Jan. 63
Watchdog Patman hears feedback on dangers of technical recession (WN) Feb. *26
What, where & why control engineers migrate (IP) ..... Feb. 61

F

Flow

Computing-control applied to a sintering process. T. R. Schuerger... Sept.*130
Control consistency with a flow bridge. Eolkin & Head..... Jan.*107
Measuring mass flow with the boundary-layer flowmeter. J. H. Laub... Mar.*112
Modifying valve characteristics to fit the process. G. L. Roth..... Jan. 69
Plugging slurry valve?..... Mar.*129
Solving flow control problems graphically. G. A. Martin (tables)... Dec. *71
What's available for measuring mass flow. G. T. Gebhardt..... Feb. *90

Frequency response

Basic concepts of feedback control. B. E. Powell..... Apr. 101
Estimating damping ratio from frequency response. C. J. Savant Jr. Dec. *95

Frequency response by sum or difference. E. J. Huddleston.....Oct.*113
Pulse response to frequency response—mechanically. Lt. Cmdr. M. T. Gardner .....May 119

Function generators

Exploiting the mercury jet switch. W. R. Davis.....Feb. *69
Proposed correlation function generator. Hines & Thal-Larsen.....Dec.*109

G

Graphic analysis

Getting maximum torque out of a two-phase servomotor. M. G. Rekoff Jr. June 121
How to establish the control problem for an on-line computer. James & Boksenbom .....Sept. 148
Modifying valve characteristics to fit the process. G. L. Roth.....Jan. 69
Solving flow control problems graphically. C. A. Martin (tables)..Dec.* 71
Use difference equations to calculate frequency response from transient response. H. Levenstein.....Apr. 90

Gyroscopes

Calculate gyroscope precession torques. A. E. Maine.....Nov.*115
Pitch g limiter protects F-102. C. G. Erickson Dec.*111

H

Hydraulics

Analyzing an arc furnace control system. J. H. Kogen.....Aug. *72
Are high performance and low cost compatible in hydraulic servos? J. G. Chubbuck .....Mar. *98
Designing stability into hydraulic governors. Soomil & Guins.....Oct. 65
How to estimate the resonant frequency of hydraulic actuators. B. C. Moore .....July 73
Hydraulics control biggest tube mill. Larson & Bigley.....Oct.*109
Proposed correlation function generator. Hines & Thal-Larsen Dec.*109
Servo performs for the public. McCarthy & Van Wicklin.....Feb. *86
Use electrohydraulic pump-servos for heavy industrial control. N. J. Nitka Apr. *81

I

Industrial control

Adjustable speed drives: key to dynamic materials handling. J. E. Oram..Feb. 78
Constant-current speed control of dc motors. E. H. Dinger.....July *88
First-hand report on control in British steel. Derek Barlow.....Oct. *74
Hydraulics control biggest tube mill. Larson & Bigley.....Oct.*109
NEMA revised standards for industrial control (WN) .....Aug. 29
Relay "memory" speeds conveyor transfer. J. W. Opel.....Mar.*124
Russians step up the pace in industrial control. G. W. Heumann (WN) Oct. *22
Static switching devices. R. A. Mathias (tables) .....May *67
Use electrohydraulic pump-servos for heavy industrial control. N. J. Nitka Apr. *81

Industry's Pulse

Aircraft companies study plunge into industrial control markets.....Aug. 59
Control engineers revitalize dc equipment business .....May 61
Defense Dept. slashes military R&D Nov. 89
Instrument makers set the pace in R&D .....Apr. 71
Labor's new assault—the four-day week Oct 59
New centers for control—I..... June 89
II July 57
The Profitless Atom: From Power to Processing .....Dec. 65
Users reflect on automatic data logging Jan. 59
What test equipment fills the control engineer's toolkit? .....Mar. 77
What, where & why control engineers migrate .....Feb. 61
What's the market for computing-control? .....Sept. 109

Inspection

Role of statistical computation in machine-tool feedback gaging. D. N. Smith Sept.*190
Testing hardness automatically. Eugene Rave Feb.*111
Testing metals "on-the-fly" with eddy currents. Richard Hochschild..Aug. *79

Instrumentation

Acoustical filters protect pressure transducers. Mylius & Reid.....Jan.*115
How They Tracked Sputnik (WN) Dec.* 22
Photometric stream analyzers—versatile instruments for measuring composition. L. G. Glasser (tables)....Oct. *87
Pitch g limiter protects F-102. C. G. Erickson Dec.*111
Selecting key intsruments for nuclear reactors. Scott & DeBacker (charts) Mar. *92
Use capacitance for accurate level measurement. F. W. Hannula..Nov.*104
Weather data by digital telemeter. J. D. Humphreys (table).....Dec.*102

Integrators

Effect of integrator motor time-constant on integration error. M. P. Pastel (tables) .....Aug. 77

L

Labor

Labor's new assault—the four-day week (IP) .....Oct. 59
UAW win at Minneapolis-Honeywell reversed (WN) .....July 174
Watchdog Patman hears feedback on dangers of technical recession (WN) Feb. *26

M

Machine tool control

AIA reports on numerical control problems (WN) .....Aug. 29
Constant-current speed control of dc motors. E. H. Dinger.....July *88
Interpolating point-to-point inputs for continuous machine control. Speller & Cooney June*114
Numerical control forces new machine tool concept (WN).....June *31
Role of statistical computation in machine-tool feedback gaging. D. N. Smith Sept.*190
Sampled-data systems. D. J. Gimpel (tables) .....Feb. 99
Static switching devices. R. A. Mathias (tables) .....May *67
21st Annual Machine Tool Electrification Forum—transient supply voltage problems plague rural machine tool users (WN) .....July *35
Unrevealed specifics retard machine tool progress (WN) .....Jan. *20

Marketing

Aircraft companies study plunge into industrial control markets (IP)..Aug. 59
Control engineers revitalize dc equipment business (IP).....May 61
Subcontracting, GE style (WN)..Sept. 61
What test equipment fills the control engineer's toolkit? (IP).....Mar. 77
What's the market for computing-control? (IP) .....Sept. 109

Material handling

Adjustable speed drives: key to dynamic materials handling. J. E. Oram .....Feb. 78
Relay "memory" speeds conveyor transfer. J. W. Opel.....Mar.*124
Velocity-displacement transfer mechanism eases materials handling problems. Wright & Reswick (tables) Dec.* 76

Mathematical analysis

Calculate gyroscope precession torques. A. E. Maine.....Nov.*115
Digital aid to frequency analysis. J. R. Jensen July*115
How to establish the control problem for an on-line computer. James & Boksenbom .....Sept. 148
Management by "analoging". G. K. Johnson .....Oct. *84
Sampled-data systems. D. J. Gimpel (tables) .....Feb. 99
Solving problems with a digital computer. A. S. Householder.....Jan. 99
Use difference equations to calculate frequency response from transient response. H. Levenstein.....Apr. 90

Measuring

An inexpensive way to measure interface level. J. P. Shoffner.....May*125
Differential measurement makes RF fields useful. W. H. Buchsbaum Feb.*119
Extend range and retain accuracy with vernier technique. J. P. O'Connor Feb.*123
Find phase angle by 3-voltmeter method . . . with a graph . . . with a special instrument. G. J. Hegedus.....July 111
Magnetic fields affect strain gages. Gunn & Billinghurst.....Aug.*109
Testing metals "on-the-fly" with eddy currents. Richard Hochschild..Aug. *79
Use capacitance for accurate level measurement. F. W. Hannula..Nov.*104
What's available for measuring mass flow. G. T. Gebhardt.....Feb. *90

Meetings—news reports

AIEE Conference on Machine Tools Jan. *20
AIEE Feedback Control Systems Committee meeting .....Sept. *44
AIEE Winter General Meeting..Mar. 30
ASME—IR Division meeting....Feb. *29
ASME/IRD third annual conference June 38
Automation Show puts products and particulars into an intimate display Feb *28
British Instruments, Electronics & Automation Exhibition .....July *22
Conceptual Clinic for New Instru-

mentation for Medicine and Biology Aug. *27
"A control engineer in Cleveland—ISA show plugs process control"....Nov. *28
"Control goes international"—organization meetings of International Federation of Control, Paris.....Nov. 42
Eastern Joint Computer Conference Feb. 30
Harvard switching symposium draws international specialists .....June 34
Heidelberg control conference. Tom Goodman .....Jan. 40
IRE show in New York.....May *36
ISA Symposium on Automatic Data Logging Systems .....Jan. *21
Magnetic Amplifier Conference...Nov. 54
NACC organized .....June 42
National Flight Test Instrumentation Symposium .....July *26
Nuclear Instrument Symposium...Nov. 56
Reduce meeting redundancy (Ed)..May 65
TIMS Third Annual Meeting.....Jan. 34
Third Penn State Seminar stresses practical production control....May 30
21st Annual Machine Tool Electrification Forum .....July *35

Memories—see Storage (data)

Meters

Meter relays without contacts. Billings & Harriman Nov.*143
Sensing nulls with dual-range compression circuits. E. F. Nowak.....Nov.*108

Missiles

At White Sands they track missiles in the lab and on the range. L. H. Young (tables) .....Nov. *97
Defense Dept. wrangles keep missile R&D policies in the air (WN)..June 44
Digital computers earn their wings (WN) .....Sept. *26
ICBM success upgrades Soviet missile technology (WN) .....Oct. 30
Tracking stations ready for satellites Nov. 36

Modulators

Servo modulators
I Where and why they're used, characteristics of the basic types. B. T. Barber (tables).....Aug. 65
II Electrochemical, electronic and semiconductor-diode units. B. T. Barber .....Oct. *96
III Semiconductor modulators, magnetic modulators and tabulated characteristics of commercial units. Barber & Klivans (tables) Nov.*122
IV Seven lab-built circuits and their test-obtained characteristics. L. S. Klivans .....Dec.* 90

Motors, electrical see Actuators

N

Networks

Simulation of
How to avoid extra integrators when simulating RLC networks. J. Otterman Nov.*111

Nonlinearities

Improve servo performance with tachometer limiting. Robert Seinfeld June 123

Nuclear reactors

British plan two-reactor power plant. R. J. Smith (WN).....Apr. *27
Controls for the boiling-water reactor. J. M. Harrer.....June 149
FM transmitter closes loop from inside reactor. Glass & Thompson....Apr.*121
Selecting key instruments for nuclear reactors. Scott & DeBacker (charts) Mar. *92

O

Optimizing control

Fitting the digital computer into process control. Phister Jr. & Grabbe..June 129
Optimize combustion control on open-hearth furnaces, F. S. Swaney..Apr.*123
Optimizing control of a chemical process. Eckman & Lefkowitz....Sept. 197

P

Personality sketches

Barnes, John L.....July *19
Close, Charley .....Jan. *17
Davis, Sid .....May *19
Early, Don .....Mar. *19
Friedrich, Hans R.....Apr. *19
Grabbe, Gene .....Feb. *23
Harrer, Joseph M.....June *21
Kochenburger, Ralph J.....Aug. *19
Rader, L. T.....Oct. *19
Salzer, John .....Sept. *25
Schuman, Ralph .....Nov. *25
Young, A. J. .....Dec.* 19

Pneumatics

Pneumatics simplify B-58 temperature controls. William Armbruster..Aug.*111
Proposed correlation function generator. Hines & Thal-Larsen.....Dec.*109
Selective control for gas distribution. Keith Pfrimmer Oct.*117

Potentiometers

How to phase-compensate loaded potentiometers. Jack Gilbert.....Jan. *82
Method of compensating loading errors in double-ended potentiometers. Jules Sandock Mar.*109

Production

Velocity-displacement transfer mechanism eases materials handling problems. Wright & Reswick (tables) Dec.* 76

Programmed systems

Batch process sequenced by rates of change. H. B. Breedlove.....Feb.*117
Freight-car classifier is plugboard-programmed Apr.*127
Interpolating point-to-point inputs for continuous machine control. Speller & Cooney June*114
Relay "memory" speeds conveyor transfer. J. W. Opel.....Mar.*124
Testing hardness automatically. Eugene Rave Feb.*111
Velocity-displacement transfer mechanism eases materials handling problems. Wright & Reswick (tables) Dec.* 76

Proportioning

Blending liquids by electronic process control. G. L. Laws.....Nov.*137
Computing-control applied to a sintering process. T. R. Schuerger..Sept.*130
Improved ratio control with composition analyzer Jan.*113
Optimize combustion control on open-hearth furnaces. F. S. Swaney..Apr.*123

Pulses

Pulse synchronizing for high-gain servomechanisms. Friedman & Schwartz Mar. 104
Triggering electronic flip-flops from mechanical switches. Roland Yii Oct. *71

R

Rationing—see Proportioning

Regulators

Applying thyratrons to control. J. H. Burnett. Pt I Jan. 88. Pt II Servo applications and stabilization...Feb. 73
Cam valve regulates precision pressure. D. D. Cherry.....Nov.*139
Key factors in selecting transistorized regulators. Michel Mamon....Mar. 107

Relays

Meter relays without contacts. Billings & Harriman Nov.*143
Relay "memory" speeds conveyor transfer. J. W. Opel.....Mar.*124
Static switching devices. R. A. Mathias (tables) .....May *67
Use relays for power amplifiers. Gibson & Tuteur .....July 107

Reliability

Reliability of redundant switches. O. B. Moan .....May 107
Reliability of redundant systems. O. B. Moan .....Feb. 85
Reliability of series-parallel combinations. O. B. Moan.....Apr. 99

Remote control

Remote control for manual pots. Joseph Salvatore Dec.*107

Research

Defense Dept. slashes military R&D (IP) .....Nov. 89
Instrument makers set the pace in R&D (IP) .....Apr. 71
Why not join R&D? (Ed).....June 95

Resonance

How to estimate the resonant frequency of hydraulic actuators. B. C. Moore July 73

S

Sampled-data

Nuclear magnetic resonance. A. R. Aikman & others (tables).....June*105
Optimizing control of a chemical process. Eckman & Lefkowitz.....Sept. 197
Sampled-data systems. D. J. Gimpel (tables) .....Feb. 99

Satellites

Tracking stations ready for satellites (WN) .....Nov. 36

Selective control

Selective control for gas distribution. Keith Pfrimmer.....Oct.*117

Servomechanisms

Effect of integrator motor time-constant on integration error. M. P. Pastel (tables) .....Aug. 77
Force-reflecting servos add "feel" to remote controls. J. P. Burnett..July 82
Getting maximum torque out of a two-

phase servomotor. M. G. Rekoff Jr. June 121
Improve servo performance with tachometer limiting. Robert Seinfeld. June 123
Pulse synchronizing for high-gain servomechanisms. Friedman & Schwartz Mar. 104
Servo modulators
I Where and why they're used, characteristics of the basic types. B. T. Barber (tables).....Aug. 65
II Electrochemical, electronic and semiconductor-diode units. B. T. Barber .....Oct. *96
III Semiconductor modulators, magnetic modulators and tabulated characteristics of commercial units. Barber & Klivans (tables)....Nov.*122
IV Seven lab-built circuits and their test-obtained characteristics. L. S. Klivans .....Dec. *90
Servo performs for the public. McCarthy & Van Wicklin.....Feb. *86
Use electrohydraulic pump-servos for heavy industrial control. N. J. Nitka Apr. *81

Simulation

Analog computer as a process controller. D. W. Russell & others.....Sept.*160
At White Sands they track missiles in the lab and on the range. L. H. Young (tables) .....Nov. *97
Dead time simulated by transport delay. Cowley & Bremer.....Apr.*129
Digital computer as a process controller. J. W. Tierney & others.....Sept. 166
How to avoid extra integrators when simulating RLC networks. J. Otterman Nov.*111
How to establish the control problem for an on-line computer. James & Boksenbom .....Sept. 148
Simulate transport lags with magnetic tape. D. C. Reukauf.....June*145

Slurries

Control consistency with a flow bridge. Eolkin & Head.....Jan.*107
Plugging slurry valve?.....Mar.*129

Sorting

Freight-car classifier is plugboard-programmed Apr.*127
How the four-tape sorter simplifies storage. R. G. Canning.....Feb. 95
Pinwheels pick post.....Nov.*132

Speed control

Adjustable speed drives: key to dynamic materials handling. J. E. Oram..Feb. 78
Applying thyratrons to control. J. H. Burnett. Pt 1 Jan 88. Pt II Servo applications and stabilization....Feb. 73
Computing-control applied to a sintering process. T. R. Schuerger..Sept.*130
Constant-current speed control of dc motors. E. H. Dinger.....July *88
Designing stability into hydraulic governors. Soomil & Guins.....Oct. 65
Use electrohydraulic pump-servos for heavy industrial control. N. J. Nitka Apr. *81

Stabilization

Designing stability into hydraulic governors. Soomil & Guins.....Oct. 65
Force-reflecting servos add "feel" to remote controls. J. R. Burnett..July 82
Improve servo performance with tachometer limiting. Robert Seinfeld June 123

Standards

Recommended practice for dynamic-response testing readied for review (WN) .....Apr. 37
Worry NOW about dynamics (Ed)..Apr. 77

Static control

Static switching devices. R. A. Mathias (tables) .....May *67
Transistor-controlled carbon-arc light June 151
Unrevealed specifics retard machine tool progress (WN).....Jan. *20

Steel

Computing-control applied to a sintering process. T. R. Schuerger..Sept.*130
First-hand report on control in British steel. Derek Barlow.....Oct. *74
Optimize combustion control on open-hearth furnaces. F. S. Swaney..Apr.*123
Steel industry takes a new look at control (WN) .....May *22

Storage (data)

How input/output units affect data-processor performance. James Gibbons (tables) .....July 97
Pinwheels pick post.....Nov.*132

Synchronizing

Pulse synchronizing for high-gain servomechanisms. Friedman & Schwartz Mar. 104
Synchronize alternators automatically Mar. 135

Systems

Analysis
Basic digital series
12. Programming the computer. Rock & Klammer (tables)....Mar. 119
Computing-control applied to a sintering process. T. R. Schuerger Sept.*130
Computing-control applied to wind tunnels. D. A. Lieberman...Sept. 134
Correlation analysis of tape-recorded data. George Fenimore.....Aug.*102
Dynamic stability control increases aircraft range. D. M. Petrie..Apr. 94
Pulse response to frequency response mechanically. Lt. Comdr. M. T. Gardner .....May 119
How to establish the control problem for an on-line computer. James & Boksenbom .....Sept. 148
Process-control problems yield to the analog computers. C. W. Worley & others .....June 97
Selecting loops for critical control. A. H. McKinney.....July 67

Design
Computing-control applied to a sintering process. T. R. Schuerger..Sept.*130
Computing-control applied to wind tunnels. D. A. Lieberman....Sept. 134
Is it less expensive to: improve controllers or increase safety margins? I. G. Stubbart & others (tables) May 102
Management by "analoging. G. K. Johnson .....Oct. 84

T

Tape readers

Magnetic
Correlation analysis of tape-recorded data. George Fenimore.....Aug.*102
Mechanical
Punched tape to shaft position—mechanically. Albert Hohmann..Jan.*111

Telemetering

Weather data by digital telemeter. J. D. Humphreys (table) Dec.*102

Temperature

Guide to costs of industrial temperature measurement. H. R. Kalbfleisch (tables) .....Oct. 81
Pneumatics simplify B-58 temperature controls. William Armbruster..Aug.*111

Testing

Automatic testing reaps unexpected dividends at Westinghouse (WN)..May 44
Frequency response by sum or difference. E. J. Huddleston.....Oct.*113
Giant sling-shot tests missile components May*123
Servos shake the B-58. W. R. Nass July*117
Testing hardness automatically. Eugene Rave Feb.*111
Testing metals "on-the-fly" with eddy currents. Richard Hochschild..Aug. *79
What test equipment fills the control engineer's toolkit? (IP).....Mar. 77

Timers

Extend range and retain accuracy with vernier technique. J. P. O'Connor Feb.*123

Training

Training: summer courses lure control engineers back to campuses (WN) May 28

Transducers

Converting process data into controller inputs. R. O. Maze (tables)..Sept. 176
Magnetic fields affect strain gages. Gunn & Billinghurst Aug.*109
Magnetic springs for accelerometers. E. S. Shepard Sr. June*143
Measuring mass flow with the boundary-layer flowmeter. J. H. Laub..Mar.*112
Radioactivity analyzes liquids and gases. V. N. Smith (tables).....Aug. *86
What's available for measuring mass flow. G. T. Gebhardt.....Feb. *90

Transistors

Key factors in selecting transistorized regulators. Michel Mamon....Mar. 107
Sensing nulls with dual-range compression circuits. E. F. Nowak.....Nov.*108

Tubes

Applying thyratrons to control. J. H. Burnett. Pt I Jan 88. Pt II Servo applications and stabilization...Feb. 73

V

Values

Are high performance and low cost compatible in hydraulic servos? J. G. Ghubbuck .....Mar. *98
Cam vale regulates precision pressure. D. D. Cherry.....Nov.*139
Magnetostriction adds precision control to high-pressure valve. R. W. Ellison Aug.*107
Modifying valve characteristics to fit the process. G. L. Roth.....Jan. 69
Plugging slurry valve?.....Mar.*129

Vibration

Acoustical filters protect pressure transducers. Mylius & Reid.....Jan.*115
Servos shake the B-58. W. R. Nass July*117

AUTHOR INDEX

Aikman, A. R. & others. Nuclear magnetic resonance ..... June *105
Amundson, Neal R. & others. The digital computer as a process controller Sept. 166
Armbruster, William. Pneumatics simplify B-58 temperature controls Aug. *111
Barber, Basil T. Servo modulators—I Aug. 65
Servo modulators—II electromechanical, electronic, and semiconductor-diode units ..... Oct. *96
Barber, B. T. & L. S. Klivans. Servo modulators III—Semiconductor modulators, magnetic modulators and tabulated characteristics of commercial units ..... Nov. *122
Barlow, Derek. A first-hand report on control in British steel..... Oct. *74
Bell, William D. How to buy control systems on bid..... Dec. 87
Bigley, W. J. & Marvin Larson. Hydraulics control biggest tube mill.... Oct. *109
Billinghurst, Edward & Jack Gunn. Magnetic fields affect strain gages... Aug. *109
Billings, S. M. & H. A. Harriman. Meter relays without contacts..... Nov. *143
Boksenbom, A. S. & E. W. James. How to establish the control problem for an on-line computer..... Sept. 148
Bower, George G. Analog-to-digital converters ..... Apr. *107
Breedlove, H. B. Batch process sequenced by rates of change..... Feb. *117
Bremer, A. & P. E. A. Cowley. Dead time simulated by transport delay Apr. *129
Buchsbaum, Walter H. Differential measurement makes RF fields useful Feb. *119
Buder, E. E. & R. C. Pfister. Computing-control applied to an airborne fire-controller ..... Sept. *138
Burnett, J. R. Force-reflecting servos add "feel" to remote controls..... July 82
Burnett, James H. Applying thyratrons to control Pt I Jan. 88, Pt II Servo applications and stabilization... Feb. 73
Burns, L. F. & others. The analog computer as a process controller.... Sept. *160
Canning, Richard G. How the four-tape sorter simplifies storage..... Feb. 95
Cherry, D. D. Cam valve regulates precision pressure ..... Nov. *139
Chubbuck, John G. Are high performance and low cost compatible in hydraulic servos? ..... Mar. *98
Codrington, R. S. & others. Nuclear magnetic resonance ..... June *105
Cooney, J. D. & Jack Speller. Interpolating point-to-point inputs for continuous machine control..... June *114
Cowley, P. E. A. & A. Bremer. Dead time simulated by transport delay Apr. *129
Davis, William R. Exploiting the mercury jet switch ..... Feb. *69
DeBacker, T. A. & C. C. Scott. Selecting key instruments for nuclear reactors Mar. *92
Decker, M. M. & Hans Mueller. Transmitting data by light modulation July *63
Dinger, E. H. Constant-current speed control of dc motors..... July *88
Dornbusch, Paul E. Computing-control applied to a tapered-sheet leveler Sept. 141
Dorsey, Samuel E. Computer demonstrates missile yaw..... Oct. *111
Eckman, D. P. & I. Lefkowitz. Optimizing control of a chemical process Sept. 197
Ellison, Robert W. Magnetostriction adds precision control to high-pressure valve ..... Aug. *107
Engel, Howard L. Computing-control applied to a fractionating column Sept. 144
Eolkin, David & Victor Head. Control consistency with a flow bridge.. Jan. *107
Erickson, Carl G. Pitch g limiter protects F-102 ..... Dec. *111
Fellows, E. G. Chromatography analyzes gas and vapor products in the plant July 75
Fenimore, George. Correlation analysis of tape-recorded data ..... Aug. 102
Fleischauer, F. J. & A. G. Thomas. The power stepping motor—a new digital actuator ..... Jan. *74
Franks, R. W. E. & others. Process-control problems yield to the analog-computer ..... June 97
Friedman, G. H. & M. Schwartz. Pulse synchronizing for high-gain servomechanisms ..... Mar. 104
Gardner, Lt. Cmdr. M. T. Pulse response to frequency response—mechanically May 119
Gebhardt, George T. What's available for measuring mass flow..... Feb. *90
Gibbons, James. How input/output units affect data-processor performance July 97
Gibson, J. E. & F. B. Tuteur. Use relays for power amplifiers..... July 107
Gilbert, Jack. How to phase-compensate loaded potentiometers ..... Jan. *82
Gimpel, Donald J. Sampled-data systems Feb. 99
Glass, F. M. & D. O. Thompson. FM transmitter closes loop from inside reactor ..... Apr. *121
Glasser, Leo G. Photometric stream analyzers—versatile instruments for measuring composition ..... Oct. *87
Process-stream refractometers .... Dec. *96
Glixon, Harry R. Can you take advantage of the cyclic binary-decimal code? Mar. 87
Goodman, Tom. More on Heidelberg Jan. 40
Grabbe, E. M. & Montgomery Phister Jr. Fitting the digital computer into process control ..... June 129
Green, D. J. Control tools develop a new navigational system ..... Jan. *65
Guins, V. G. & E. Y. Soomil. Designing stability into hydraulic governors Oct. 65
Gunn, Jack & Edward Billinghurst. Magnetic fields affect strain gages... Aug. *109
Hamming, R. W. Checking techniques for digital computers..... May 111
Hannula, F. W. Use capacitance for accurate level measurement.... Nov. *104
Harrer, J. M. Controls for the boiling-water reactor ..... June 149
Harriman, H. A. & S. M. Billings. Meter relays without contacts..... Nov. *143
Head, Victor & David Eolkin. Control consistency with a flow bridge.. Jan. *107
Hegedus, Gene J. Find phase angle by 3-voltmeter method . . . with a graph . . . with a special instrument July 111
Heumann, G. W. The Russians step up the pace in industrial control... Oct. *22
Hines, D. P. & H. Thal-Larsen. A proposed correlation function generator Dec. *109
Hochschild, Richard. Testing metals "on-the-fly" with eddy currents..... Aug. *79
Hohmann, Albert. Punched tape to shaft position—mechanically ..... Jan. *111
Homan, Charles J. & others. The digital computer as a process controller Sept. 166
Householder, Alston S. Solving problems with a digital computer..... Jan. 99
Huddleston, E. J. Frequency response by sum or difference..... Oct. *113
Humphreys, J. D. Weather data by digital telemeter ..... Dec. *102
Hyman, M. A. & others. Is it less expensive to improve controllers or increase safety margins?..... May 102
James, E. W. & A. S. Boksenbom. How to establish the control problem for an on-line computer..... Sept. 148
Jensen, Jens R. Digital aid to frequency analysis ..... July *115
Johnson, Gordon K. Management by "analoging" ..... Oct. *84
Kalbfleisch, Howard R. Guide to costs of industrial temperature measurement Oct. 81
Kirchner, F. F. & others. Nuclear magnetic resonance ..... June *105
Klammer, Wallace W. & Sibyl M. Rock. Programming the computer.... Mar. 119
Klivans, L. S. Servo modulators IV—Seven lab-built circuits and their test-obtained characteristics .... Dec. *90
Klivans, L. S. & B. T. Barber. Servo modulators III—Semiconductor modulators, magnetic modulators and tabulated characteristics of commer-

AUTHOR INDEX

cial units Nov.*122
Kogen, James H. Analyzing an arc furnace control system ..... Aug. *72
Larson, Marvin & W. J. Bigley. Hydraulics control largest tube mill.... Oct.*109
Laub, J. H. Measuring mass flow with the boundary-layer flowmeter... Mar.*112
Laws, G. L. Blending liquids by electronic process control..... Nov.*137
Lefkowitz, I. & D. P. Eckman. Optimizing control of a chemical process Sept. 197
Levenstein, H. Use difference equations to calculate frequency response from transient response ..... Apr. 90
Lieberman, David A. Computing-control applied to wind tunnels..... Sept. 134
Maine, A. E. Calculate gyroscope precession torques Nov.*115
Six control problems solved by magnetic amplifiers ..... Dec.* 80
Mamon, Michel. Key factors in selecting transistorized regulators ..... Mar. 107
Marcotte, R. P. & others. Is it less expensive to: improve controllers or increase safety margins?..... May 102
Martin, G. A. Solving flow control problems graphically ..... Dec.* 71
Mathias, Robert A. Static switching devices ..... May *67
Maze, Robert O. Converting process data into controller inputs..... Sept. 176
McCarthy, W. E. & W. A. Van Wicklin. A servo performs for the public Feb. *86
McGregor, W. K. & others. The analog computer as a process controller Sept.*160
McKinney, A. H. Selecting loops for critical control ..... July 67
Moan, Obert B. Reliability of redundant switches ..... May 107
Reliability of redundant systems.. Feb. 85
Reliability of series-parallel combinations ..... Apr. 99
Moore, B. C. How to estimate the resonant frequency of hydraulic actuators ..... July 73
Mueller, Hans, M. M. Decker. Transmitting data by light modulation July *63
Mylius, R. D. & R. J. Reid. Acoustical filters protect pressure transducers Jan.*115
Nass, W. R. Servos shake the B-58 July*117
Nemanic, Donald J. & others. The digital computer as a process controller Sept. 166
Nitka, Norbert J. Use electrohydraulic pump-servos for heavy industrial control ..... Apr. *81
Nowak, E. F. Sensing nulls with dual-range compression circuits..... Nov.*108
O'Connor, John P. Extend range and retain accuracy with vernier technique Feb.*123
Opel, J. W. Relay "memory" speeds conveyor transfer Mar.*124
Oram, J. E. Adjustable speed drives: key to dynamic materials handling Feb. 78
O'Rourke, Calvin O. Electronic trail-finding May*117
Otterman, J. How to avoid extra integators when simulating RLC networks Nov.*111
Pastel, Marvin P. Effect of integrator motor time-constant on integration error ..... Aug. 77
Petrie, D. M. Dynamic stability control increases aircraft range..... Apr. 94
Pfister, R. C. & E. E. Buder. Computing-control applied to an airborne fire-controller Sept.*138
Pfrimmer, Keith. Selective control for gas distribution Oct.*117
Phister, Montgomery Jr. & E. M. Grabbe. Fitting the digital computer into process control ..... June 129
Pink, J. F. & others. Process-control problems yield to the analog computer ..... June 97
Powell, Bruce E. Basic concepts of feedback control ..... Apr. 101
Rabinow, J. Scanning improves headlight dimmer Mar.*131
Ragland, E. A. & D. E. Wassall. The digital answer to data telemetering Aug. *95
Rave, Eugene. Testing hardness automatically Feb.*111
Reid, R. J. & R. D. Mylius. Acoustical filters protect pressure transducers Jan.*115
Rekoff, M. G. Jr. Getting maximum torque out of a two-phase servomotor June 121
Reswick, J. B. & Justin Wright. Velocity-displacement transfer mechanism eases materials handling problems Dec.* 76
Reukauf, D. C. Simulate transport lags with magnetic tape..... June*145
Rock, Sibyl M. & Wallace W. Klammer. Programming the computer.... Mar. 119
Roth, Gilbert L. Modifying valve characteristics to fit the process.... Jan. 69
Russell, D. W. & others. The analog computer as a process controller Sept.*160
Salvatore, Joseph. Remote control for manual pots Dec.*107
Salzer, John M. From controller output to process actuation..... Sept. 183
Sandock, Jules. A method of compensating loading errors in double-ended potentiometers ..... Mar. 109
Schuerger, Thomas R. Computing-control applied to a sintering process Sept.*130
Schwartz, M. & G. H. Friedman. Pulse synchronizing for high-gain servomechanisms ..... Mar. 104
Scott, C. C. & T. A. DeBacker. Selecting key instruments for nuclear reactors ..... Mar. *92
Seinfeld, Robert. Improve servo performance with tachometer limiting.. June 123
Shepard, E. S. Sr. Magnetic springs for accelerometers June*143
Shoffner, J. P. An inexpensive way to measure interface level..... May*125
Smith, David N. Role of statistical computation in machine-tool feedback gaging Sept.*190
Smith, R. J. British plan two-reactor power plant ..... Apr. *27
Smith, Vigo N. Radioactivity analyzes liquids and gases..... Aug. *86
Soomil, E. Y. & V. G. Guins. Designing stability into hydraulic governors Oct. 65
Speller, Jack & J. D. Cooney. Interpolating point-to-point inputs for continuous machine control..... June*114
Steghart, F. A simple noninteracting three-term controller ..... June 139
Stubbart, I. G. & others. Is it less expensive to: improve controllers or increase safety margins?..... May 102
Swaney, F. S. Optimize combustion control on open-hearth furnaces... Apr.*123
Thal-Larsen, H. & D. P. Hines. A proposed correlation function generator Dec.*109
Thomas, A. G. & F. J. Fleischauer. The power stepping motor—a new digital actuator ..... Jan. *74
Thompson, D. O. & F. M. Glass. FM transmitter closes loop from inside reactor Apr.*121
Tierney, John W. & others. The digital computer as a process controller Sept. 166
Troy, D. J. Infrared process-stream analyzers Nov.*116
Tuteur, F. B. & J. E. Gibson. Use relays for power amplifiers..... July 107
Van Wicklin, W. A. & W. E. McCarthy. A servo performs for the public Feb. *86
Vannah, William E. The goal is improved performance ..... Sept. 126
Wassall, D. E. & E. A. Ragland. The digital answer to data telemetering Aug. *95
Worley, C. W. & others. Process-control problems yield to the analog computer ..... June 97
Wright, Justin & J. B. Reswick. Velocity-displacement transfer mechanism eases materials handling problems Dec. * 76
Yii, Roland. Triggering electronic flip-flops from mechanical switches.. Oct. *71
Young, L. H. At White Sands they track missiles in the lab and on the range Nov. *97